A "STANDALONE" DATA BASE COMPUTER

INPUT

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Professional staff i in the information processing industry ions in operations, marketing, or planr actical solutions to complex business pr

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INPUT (Y-IN-IN2)
A "Standalone" Data Base
(computer

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PREPARED FOR:

INTEL CORPORATION

APRIL 1978

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1 INTRODUCTION

I INTRODUCTION

A. BACKGROUND AND PURPOSE

The research for a "standalone" data base computer is a follow-on to the original study which was for a "backend" data base computer, the results of which were reported in the INPUT study, A Data Base Computer, dated December 1977. This report and A Data Base Computer should be considered as a set and are related in the following ways:

- Intel's product proposal for A Data Base Computer describes the architecture, functional capability, and potential benefits of both the "backend" and "standalone" systems, and should be used when referencing the reports.

- The system size of "backend" systems ranged from $280K to $1,258K (including secondary storage) and this study assumed system size of $100K to $300K. (Although system size for the "standalone" systems has been extended to $500K during the study, the market is still considered to be for a "small" data base computer.)

- The scope of this study will provide comparisons of the markets for standalone and backend systems.

- An approximate technological and competitive environment will be projected for the mid 1980s (for both systems). Intel agreed that distributed data processing should be addressed in this environment.

- This report will extend the original forecast period (1978-1982) through 1987 for both systems.

B. RESEARCH

The research for this program was constructed as follows:

- Sixteen vendors of hardware, software and remote computing services were interviewed to obtain current and projected market information.

- Originally, 50 user interviews were proposed. With Intel's concurrence, this was extended to 75. These interviews were designed to obtain user reactions in the following:

  - Use and acceptance of DBMS and distributed data processing (DDP) on mini computers.

  - Opinions concerning functions, applications and industry opportunities for both DBMS and DDP.

  - Acceptable size for minicomputers in a distributed processing environment.

  - A check of user technical knowledge, understanding and preferences against the information obtained during the backend study.

- The interviews were spread across fourteen industry classifications and aimed at both data base users and non-users.

- Research analysis of available data involving DBMS, DDP and technological projections was done in support of forecasts.

II EXECUTIVE SUMMARY

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A. CONCLUSIONS

- Data base management systems (DBMS) on minicomputers, while not of great significance at the present time, are viewed by both vendors and users as being a major growth area over the next decade.

- Vendors do not have any consistant view of the market size for such systems.

- Both the standalone and backend DBC's address user problems created by IBM's product strategy which can be summarized as follows:

  - Large central processors burdened by excessive systems software overhead.

  - Centralized data bases using a DBMS (IMS) which has such poor performance it has limited applications development.

  - A network architecture (SNA) which has actually served to slow the trend towards distributed data processing (DDP).

- Users are actively looking for alternative solutions to achieve the potential benefits of DBMS and many alternatives are being offered (or planned).

- There is a wide range of competitive software systems and 71% of the users evaluated other systems before selection of their DBMS.

- There was an expressed desire for DBMS on minicomputer systems (70%) and minicomputer vendors recognize this as a growth area.

- Users are anxious to be interviewed about the future of DBMS - as demonstrated by the research for both the standalone and backend DBC's.

- Both DBMS and distributed data processing (DDP) seem to have appeal to all commercial users without particular regard for the usual applications and/or industrial calssifications.

- Both DBMS and DDP pose a significant threat to IBM's most cherished business tactic - account control. It must be assumed that IBM will react to these threats and its hardware/firmware/software strategy must be anticipated in order to forecast markets for new computer/communications products.

- The potential market for DBMS oriented minicomputer systems is enormous.

  - Total U.S. minicomputer shipments will rise from $2.2 billion in 1977 to $7.8 billion in 1982 and $19.5 billion in 1987.

  - Total shipments of DBMS oriented minis (within the Intel standalone price range) will rise from $1.6 billion in 1982 to $4.8 billion in 1987.

- There will be severe competition in this marketplace including a new product line from IBM. Even so, with early entry (1980), it is forecast that Intel could possibly achieve annual sales of $400+ million by 1987.

- The announcement of a new IBM product line (with a new DBMS) will leave many large scale IBM users with "obsolete" systems. The effective life of these systems (both functional and capacity) could be extended significantly with an Intel backend DBC.

- INPUT projects that Intel's market for the backend DBC will grow from $50 million (forecast for 1982 in the "backend" study) to $249 million in 1987.

- While the purpose of this study was not to evaluate the relative potential (and/or advantages) of the standalone system vs. the backend system, INPUT concluded there were certain advantages for the backend system:

  - It has more product distinction (especially if marketed as an "intelligent data base memory system").

  - Marketing and support problems will not be as severe with the backend system.

  - The performance advantage of the backend system against competition is more certain.

  - There will be less competition for the backend system - especially since IBM will be concentrating on its new product line to support distributed processing.

- Since both the standalone and backend DBC have such broad applications and industry potentials, the technical support (software ane systems engineering) should concentrate on a functional specialty which crosses industry boundaries.

B. RECOMMENDATIONS

- Develop the backend system for introduction as soon as possible. (If it could be available in 1980, the DBC would have great appeal to large scale System/370 users.)

- Introduce the system as an addition to the memory hierarchy - a new intelligent memory system specifically designed to facilitate implementation of advanced DBMS concepts and improve host performance.

- Monitor and evaluate IBM's technical and marketing strategies for DBMS and DDP. Introduce the "standalone" only after IBM's product line for the mid-1980s can be determined with some degree of certainty (INPUT currently anticipates a major IBM announcement in 1980-81).

- Support and market both systems as being especially well suited for highly sensitive data associated with resource planning, research and ad hoc reporting.

  - Personnel systems.

  - Management information and strategic planning systems.

  - Medical records.

  - Government data bases associated with health and welfare.

  - Financial records.

- Avoid development of specific applications software and target general purpose software for the non-EDP trained user. In addition to classic DBMS functions, the standalone system should integrate conventional data entry and text processing.

- As recommended in the previous report, explore the possibility of establishing a relationship with a substantial company to supplement marketing and/or support activities.

III THE TECHNOLOGICAL AND COMPETITIVE ENVIRONMENT

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A. COMPUTER/COMMUNICATIONS NETWORKS

- It is generally agreed that computer and communications technologies are converging towards computer/communications networks. The ultimate form these networks will take is not clear, but it leads to a complex technological and competitive environment which must be understood in order to forecast any new or associated computer related product.

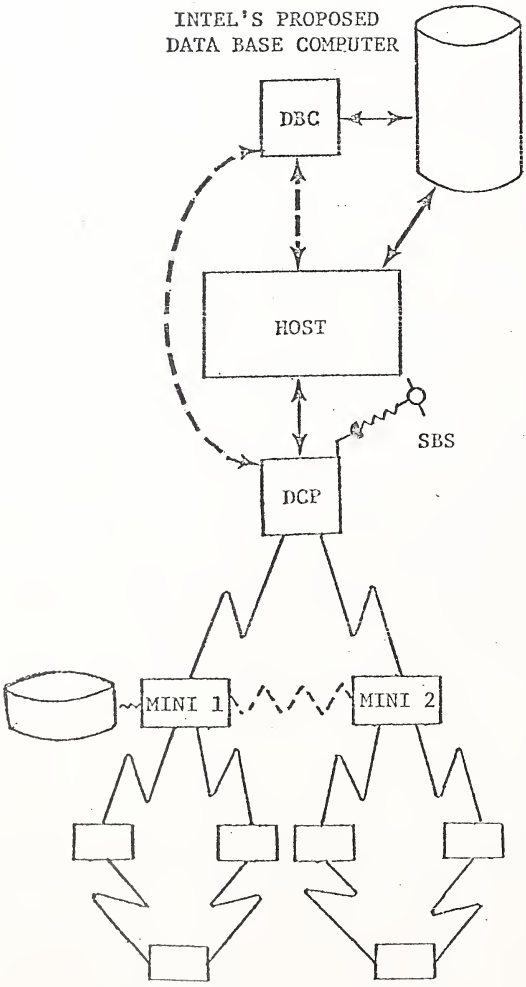
- Exhibit III-1 depicts a general, hierarchical (star type) computer/communications network. It is usually conceded that there is a trend towards redistribution of data processing expenditures in favor of terminals, minicomputers and communications in relation to large general purpose processors. On-line mass storage at all levels will continue to grow with no predictable limit on the ultimate market size.

B. IBM

- IBM continues to dominate the commercial data processing market. However, its traditional strength has been in general purpose mainframes and associated peripherals. It has not dominated the fastest growing portions of the computer/communications networks - data communications processors, minicomputers and terminals. And, until Satellite Business Systems (SBS) is operational in the early 1980s, it will not share in rising communications revenues.

EXHIBIT III-1

HIERACHICAL COMPUTER/COMMUNCIATIONS NETWORK



- SECONDARY STORAGE OF ALL KINDS
- LARGE GENERAL PURPOSE MAINFRAMES AND ASSOCIATED SOFTWARE
- DATA COMMUNICATIONS CONTROLLERS AND PROCESSORS
- COMMUNICATIONS CARRIERS
- MINICOMPUTERS OF VARIOUS SIZES WITH ASSOCIATED STORAGE
- INTELLIGENT & DUMB TERMINALS (INCLUDES, STANDALONE DATA ENTRY EQUIPMENT)

- IBM's strength in selling its customers ever larger mainframes on a "stepping-stone" basis has been based on the oppressive overhead of its programming support (operating systems, data base systems, and interactive terminal support). IBM's control of the general purpose mainframe market is currently threatened as follows:

  - Plug-compatible mainframe manufacturers (PCMs) who have forced IBM to announce the 30XX series and adjust price/performance throughout its product line. Despite this drastic price/performance improvement on IBM's part, PCMs continue to flourish.

  - Minicomputer price/performance which exceeds that of large general purpose systems, and results in significant replacement of host processing for timesharing, batch commercial work, and terminal servicing functions.

  - Intelligent terminals (and minicomputers) which result in substantial off-loading of data entry and editing functions.

  - The proposed off-loading of data base functions by backend processors such as Intel's data base computer.

- IBM wants to maintain its historical growth pattern and unquestionably has a business plan to accomplish this objective. Such a plan must provide for doubling revenues every five years and results in 1982 and 1987 revenues of $31 million and $55 million respectively. (See Exhibit III-2.)

- If IBM wants to meet its growth objectives it must not only defend its host market but have significant penetration of the distributed processing growth area as well.

- IBM's published "plan" for distributed processing is its Systems Architecture (SNA). (See Exhibit III-3.) SNA reveals the following:

EXHIBIT III-2

IBM'S HISTORICAL AND

PROJECTED REVENUE OBJECTIVES

($ BILLION)

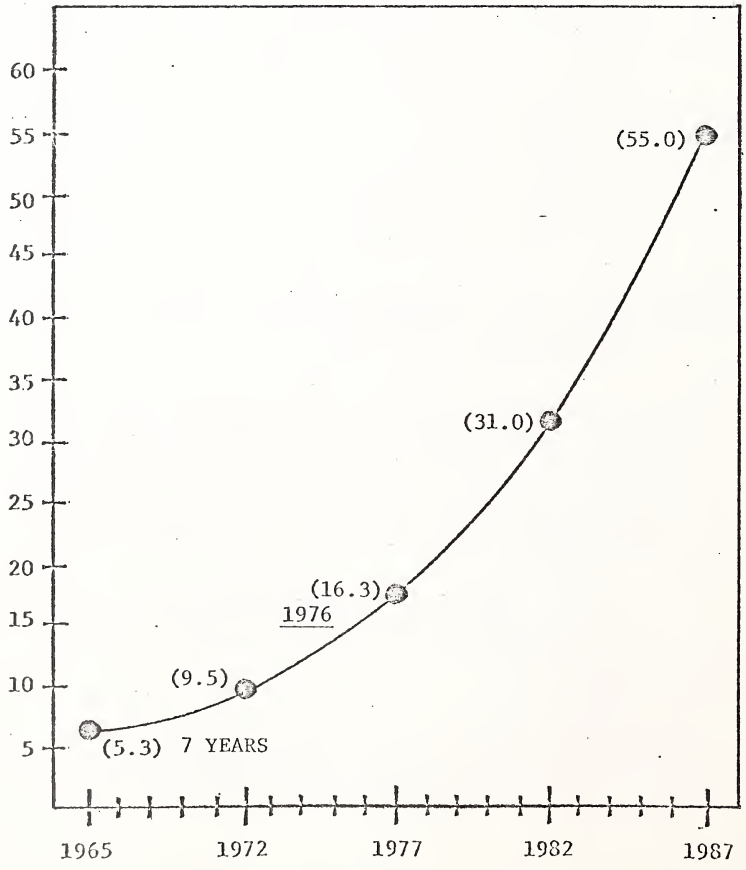
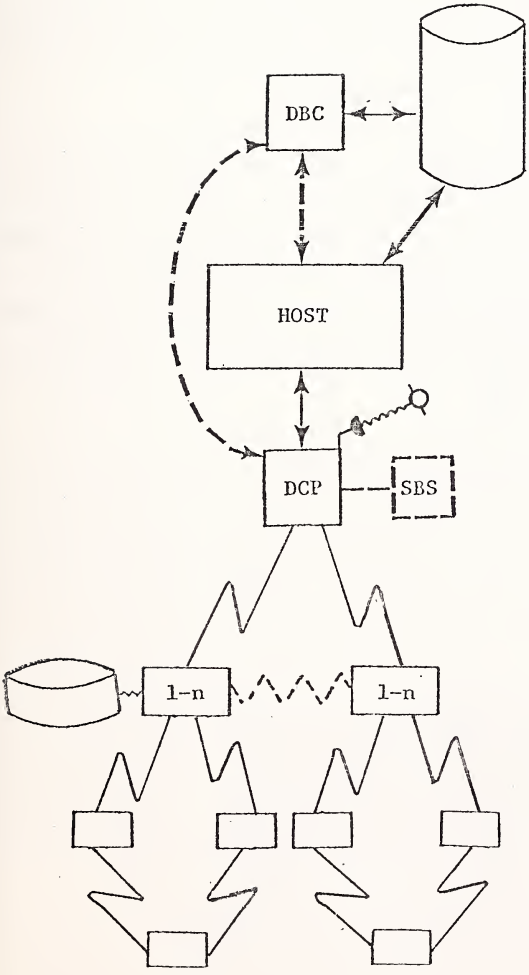


EXHIBIT III-3

SYSTEM NETWORK ARCHITECTURE

(SNA)



HARDWARE 370/30XX
SOFTWARE:
MVS/IMS/VTAM

HARDWARE 370X
SOFTWARE: NCP

COMMUNICATIONS
PROTOCOL: SDLC

HARDWARE:
3790 TYPE CLUSTER
CONTROLLER
SOFTWARE:
VARIOUS APPLICATIONS
ORIENTED TCPs

- Large scale host computer required because of centralized control of networks and centralized data base.

- Limited functions in 370X and 3790 with software controlled from host.

- Definitely large systems oriented with minimal distribution of either processing or data base.

- SNA and its associated hardware and software have met with less than spectacular success among IBM customers. It is viewed by many as having the potential for restricting the connection of "foreign" hardware in the network and there is some justification for this concern.

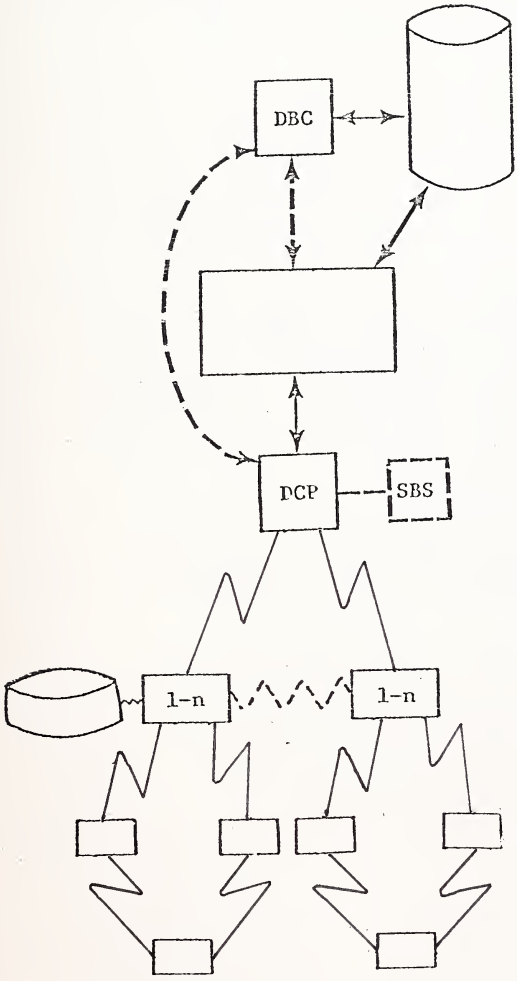
- IBM's success or failure with various plans to meet its growth objectives are important to the industry because the "agile giant" has been known to change direction suddenly with unpredictable results for customers and competitors alike. When IBM has a "problem" it is going to do something. Exhibit III-4 lists INPUT's rating of current and projected problem areas in priority of order. While it is beyond the scope of this study to analyze these ratings in detail, the following explanations are in order:

  - Priority 1: IBM's reaction to the PCMs has already caused price adjustments throughout the industry. However, the PCMs are still thriving and IBM cannot and will not permit this to continue. Additional interim steps will be taken between now and the time a new product line is announced (INPUT estimates such announcement on the 1980-81 timeframe).

  - Priority 2: Distributed processing (SNA) still presents a problem for the reasons mentioned above. This problem must be solved with a new product line and not with IBM's current technology. Series/1 will hold the line until then. (The new product line's timing with SBS is not by chance.)

EXHIBIT III-4

CURRENT & PROJECTED PRIORITIES



	THREAT LEVEL PRIORITY		
	CURRENT	1982	1987
SECONDARY STORAGE & MEMORY	4	4	2
PCM'S 370/30XX	1	7	7
MVS/IMS/VTAM	3	2	6
SNA/370X			
MINICOMPUTERS 3790	2	1	4
TERMINALS			
WORD & TEXT PROCESSING	5	3	1
RCS	6	6	5
MICROS CONSUMER	7	5	3

- Priority 3: IBM has had remarkable success with IMS considering the quality of the product. Immediate improvement is required, but IMS will not be the primary data base system for the new product line.

- Priority 4: PCP's penetration can be tolerated at current levels as IBM deals with more pressing problems.

- Priority 5: Word and text processing systems have an extremely important role to play in IBM's growth plans for the mid-late 1980s, but things are reasonably well under control.

- Priority 6: Remote computing services are growing more rapidly than the computer industry as a whole and IBM's agreement with CDC expires at the end of next year. However, INPUT does not feel IBM will seriously consider re-entering the conventional RCS market.

- Priority 7: Despite IBM's success in business typewriters it has never entered the consumer market. With a major announcement due in two years, it is not likely that IBM will venture into unfamiliar territory. However, as the growth rate accelerates into the 1990s, they will certainly be tempted.

C. SUMMARY OF TECHNOLOGICAL AND COMPETITIVE ENVIRONMENT

- IBM dominates the competitive environment and attempts to control the technological environment. Any proposed new data processing product must be forecast in anticipation of IBM strategy.

- All forecasts should be monitored on a continuing basis to determine impact as IBM's strategy is disclosed.

IV RESULTS OF VENDOR INTERVIEWS

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A. INTRODUCTION

- Vendor interviews were distributed as follows:
  - Five software vendors.
  - Eight hardware vendors.
  - Four computer services vendors.
- The purpose was not to obtain statistical data and the questionnaire was used primarily as an interview guide.
- In some cases, several phone interviews occurred in the same organization, and additional information was obtained during the Market Analysis Service data base study which was being conducted concurrently.
- Some vendors targetted were not responsive and others were selected to obtain specific information.

B. GENERAL RESULTS FROM QUESTIONNAIRE

- In response to estimates on off-loading of host systems on the front end:

  - Only about one-third of those interviewed were responsive to the questions and practically all of those were hardware vendors. While this may not be surprising, it indicates software and services vendors may not be keeping up with hardware potential and may get some unpleasant surprises.

  - There was general concurrence with data entry error rates (20%), off-loading by editing at point of entry (30%) and mini-DBMS off-loading (50%). In fact, most felt 50% might be low.

- There was general agreement that data processing and word processing would converge in the early to mid 1980s and intracompany electronic mail was possible now. Intercompany electronic mail was indicated to occur between 1985-1987.

- From the interviews conducted, it is not felt that very many respondents fully appreciate the impact the merging of word and data processing will have on DBMS design and the entire data processing industry.

- The consensus about distributed data bases is essentially as follows:

  - Most data bases lend themselves to distribution.

  - Centralization is required for "very large" data bases or for central management control of accounting type functions.

  - The definition of a "very large" data base varied from 100 million bytes to 20 billion bytes. Throwing out the extremes of the range, the mean was roughly 3 billion bytes but there was still significant dispersion of opinion.

- The factors prompting distributed processing are as follows:

  - Local management control of data and processing (25% mentioned).

  - The economics of DDP (30% mentioned).

  - Responsiveness and people productivity (18% mentioned).

  - Miscellaneous comments included: end users are fed up; its the latest buzz word; frustrated with DP management; and communication costs will force it.

- The factors inhibiting DDP were deemed to be:

  - Software related (50% mentioned).

  - IBM (18% mentioned).

  - Other limiting factors were cost, management problems and limited hardware capability.

  - Several respondents stated distributed processing was at least 10 years away.

- Most vendors did not feel comfortable estimating the shift in EDP hardware and communications budgets but those who did agreed that:

  - Central processors will decrease as a percentage of EDP hardware costs in the 1980s.

  - Minicomputers and intelligent terminals will increase.

  - Data entry costs will decrease.

  - Communications costs (despite DDP) will probably double.

- The data on dollar size of minicomputers, intelligent terminals, and configurations varied too much to be meaningful, but several interesting ideas were put forth:

  - A minicomputer becomes a "midi" or general purpose computer based on the availability of software. (For example, a naked HP3000 would be classified as a mini but with its extensive support it would be classified as a general purpose computer.)

  - Any system requiring more than 3 people to support it is no longer a mini.

  - Add disk storage to an intelligent terminal and it becomes a minicomputer.

- Over 70% of those responding felt that a query language, report generator, data manipulation and a communications interface would be either required (or highly desirable) in order to support DBMS in a DDP environment.

- Reactions to data models in the same question elicited the following comments: not important; don't care; don't standardize early; and flexibility is required. However, there was at least a general awareness among the respondents of the hierarchical model - probably because of the vendors selected.

- Most respondents could not respond to how currently installed minis are being used but the concensus seemed to be that the currently installed base is predominate in a timesharing mode using BASIC or FORTRAN. However, there is general agreement that the future lies with commercial, non-EDP oriented systems and that implies DBMS.

C. SPECIFIC VENDOR INFORMATION OF IMPORTANCE

- Hewlett Packard

  - There are currently 800-1000 HP 3000s installed which have purchased IMAGE 3000 and current shipments are running at 75% of systems shipped.

  - There is no estimate as to how extensively IMAGE is being used and since it costs only $3,000 plus a maintenance contract of $3,000 ($25 per month for 48 months) it would not have to be used extensively to justify its purchase.

  - IMAGE is currently in a maintenance mode and it was implied that both a relational system and a backend computer were being considered.

  - The HP 3000 currently has unique capability in being able to share and transfer data bases between systems. It is being used to demonstrate SBS communications capability.

- DEC

  - DEC currently has DBMS installed on 100 of 800 DEC 10s and 20s.

  - DBMS is evidently a poor performer and is not being used extensively.

- Tandem

  - Tandem shipped a ten processor system valued at $2 million for a library application and feel they compete against anything from minicomputers ($100,000) up to the largest Amdahl.

- Their market is on-line, transaction oriented systems requiring high reliability and security.

- While Tandem's data base capabilities are currently limited, they do partition the data base across processors which could result in attractive performance characteristics. They have a well-qualified (though small) staff of programmers who are engaged in extending their current data base and language capabilities.

• Cyberdata

- Cyberdata is currently marketing a multi-microprocessor based system to the retail industry. The system has more potential power than most "backroom" minicomputers and can service up to 60 point of sale terminals while permitting batch processing, inquiry and communications with other systems.

- The data base and support philosophy is to tailor the system and not support general purpose software.

- Cyberdata's design philosophy permits the design of a cheap "data base computer" tailored to a particular application with high performance characteristics.

• IBM

- The current official corporate policy is to permit DPD and GSD to compete in the distributed processing environment. For example, Series/1 is being proposed in competition to SNA by off-loading communications functions and as a substitute "cluster controller."

- A good source indicates there is no current plan to drop IMS and "flexibility" of data models is the current theme.

- SNA is still the guiding architecture, and limited (and controlled) distribution of processing and data base is still the guiding principle.

- Cullinane

  - Indicated in a separate interview that their implementation of a backend data base computer with software alone did not have adequate performance.

- Information Sciences

  - Information Sciences is a leader in human resources systems (personnel). They recently announced they are implementing their basic personnel system on Microdata and marketing the hardware and software as a package.

  - It was determined during the course of the interviews that Microdata was selected because Reality permitted easy implementation of their system (which is normally run on IBM systems).

D. CONCLUSIONS FROM VENDOR INTERVIEWS

- Most data base software vendors are not sensitive to advanced technological trends in hardware, software or network architecture. This is probably due to the fact that most systems are built upon concepts which are fifteen years old. There has been substantial investment in these systems (MRI estimates 120 man years in S2000 since 1972) and there is great pressure to keep improving an old and perhaps obsolete product.

- Since IMS is the standard against which others are measured, it has been possible to succeed in the marketplace.

- Individuals and small companies are on the leading edge of DBMS software development but they do not have hardware development capability.

- Hardware vendors are more sensitive to combined hardware/software possibilities than software vendors, but they normally have the responsibility of an established customer base. Only the small companies (Tandem & Cyberdata) have the freedom to put together imaginative combinations of hardware and software.

- Computer services companies must normally follow somewhat traditional lines in order to be accepted in the marketplace. However, the study of a backend DBC revealed MAGNUM from Tymshare and NOMAD from NCSS have decided to market combined hardware and services.

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V RESULTS OF USER INTERVIEWS

V RESULTS OF USER INTERVIEWS

A. INTRODUCTION

- The backend DCB study was directed toward those who had a DBMS installed. The standalone was designed to sample approximately 60% DBMS users and 40% non-users across industry lines. In addition, an effort was made to interview users with less well known systems installed.

- Exhibit V-1 shows the user interview sample and the number of interviews conducted in the 14 industry sectors studied. The names of the DBMS installed at the user sites studied are shown in Exhibit V-2. The previous study showed IMS had approximately 50% of the large scale DBMS market. Even though this research attempted to expand coverage of other systems, IMS still represented 38% of the interview sample. No statistical significance can be attributed to the frequency distribution for the reasons mentioned above; it is presented for reference purposes only.

B. DBMS USAGE AND SELECTION PROCESS

- The backend DBMS study projected that 75% of the user application set was suited for DBMS. However, actual usage by those having systems installed was as follows:

EXHIBIT V-1

USER INTERVIEW SAMPLE

INDUSTRY	ON-SITE INTERVIEWS	TELEPHONE INTERVIEWS	TOTAL
BANKING	2	5	7
DISCRETE MANUFACTURING	-	5	5
PROCESS MANUFACTURING	-	5	5
RETAIL/WHOLESALE	-	5	5
EDUCATION	-	5	5
STATE/LOCAL GOVERNMENT	2	3	5
UTILITIES	1	4	5
INSURANCE	-	5	5
MEDIA	2	5	7
MEDICAL/HOSPITALS	-	5	5
TRANSPORTATION	1	4	5
DIVERSIFIED FINANCIAL	2	4	6
LEGAL SYSTEMS	-	5	5
COMPUTER SERVICES	1	4	5
TOTAL	11	64	75

EXHIBIT V-2

DISTRIBUTION OF INSTALLED DBMS SYSTEMS

NAME OF DBMS	NUMBER OF SITES INTERVIEWED	% OF TOTAL	AVERAGE YEARS OF EXPERIENCE
IMS	18	38%	3.0
IDMS	8	16	2.5
TOTAL	8	16	4.5
ADABAS	5	10	1.0
SYSTEM 2000	2	4	2.0
DATA COM/DB	1	2	1.0
UNIVAC DMS	1	2	5.0
MINI BASED DBMS	4	8	2.0
IN-HOUSE DEVELOPED DBMS	2	4	6.0
TOTAL	49	100%	3.0

- Fifty-one percent of users had less than 10% of their application load installed under DBMS.

- Seventy-five percent had less than 30% of these applications installed on DBMS (the backend study showed 55% with less than 30% installed).

- Only 4% had over 75% of their application load installed on DBMS (whereas 25% reported this percentage on the backend study).

- The conclusion must be reached that most potential applications have not yet been implemented even by those with DBMS installed. This lessens the conversion impact.

- Users are analyzing various alternatives before selecting a DBMS.

  - Seventy-one percent of the 45 users responding said that they did an extensive analysis of other systems before making a decision.

  - The systems most frequently mentioned as being rejected were: TOTAL (21); System 2000 (13); IMS (12); ADABAS (10); and IDMS (6). Numerous other systems were also mentioned as having been considered.

  - The selection of a DBMS seems to be a very competitive situation.

- However, only 9% of 44 respondents indicated they used a DBMS on a remote computing service before selection.

- The cost of DBMS was as follows:

  - The initial purchase price of systems selected ranged from $22.5K (TOTAL) to $112K (System 2000) with a mean of $55.8K. The price of leased systems ranged from $1K (IDMS) to $5K (IMS) per month with a mean of $2.4K.

INP

- Total investment to implement DBMS ranged from $35K to $5 million. This cost includes purchase price (or lease commitment), training costs and conversion costs.

- On-going annual expenditures ranged from $1K to $1 million with a mean of $122K for 26 respondents.

- The cost of DBMS as perceived by users is quite high and 70% of the respondents felt their expenditures would increase.

- In addition, 74% of current users have upgraded their computer since installing DBMS. However, only 37% attributed the upgrade directly to the DBMS.

- After all of the complexity, problems and expense, 96% of the 47 respondents indicated they would still buy a DBMS if they had it to do over again. And, 84% stated they would select the same system.

C. IMPORTANT ATTRIBUTES OF DBMS

- Users were asked to rank five attributes of DBMS. The overall weighted ratings are contained in Exhibit V-3. The chart clearly shows the most important attribute to be improved control of data, and cost savings are rated surprisingly low.

- When users were asked to rank required improvement of DBMS (See Exhibit V-4) they ranked ease of use and performance as the two most important features. Vendor support and training were ranked quite low which would indicate reasonably good support. A separate analysis of IMS users showed they placed performance as more important than ease of use which reversed the order established by the overall population.

EXHIBIT V-3

USER RANKING OF DBMS ATTRIBUTES

(FREQUENCY OF HIGH AND LOW RATINGS)

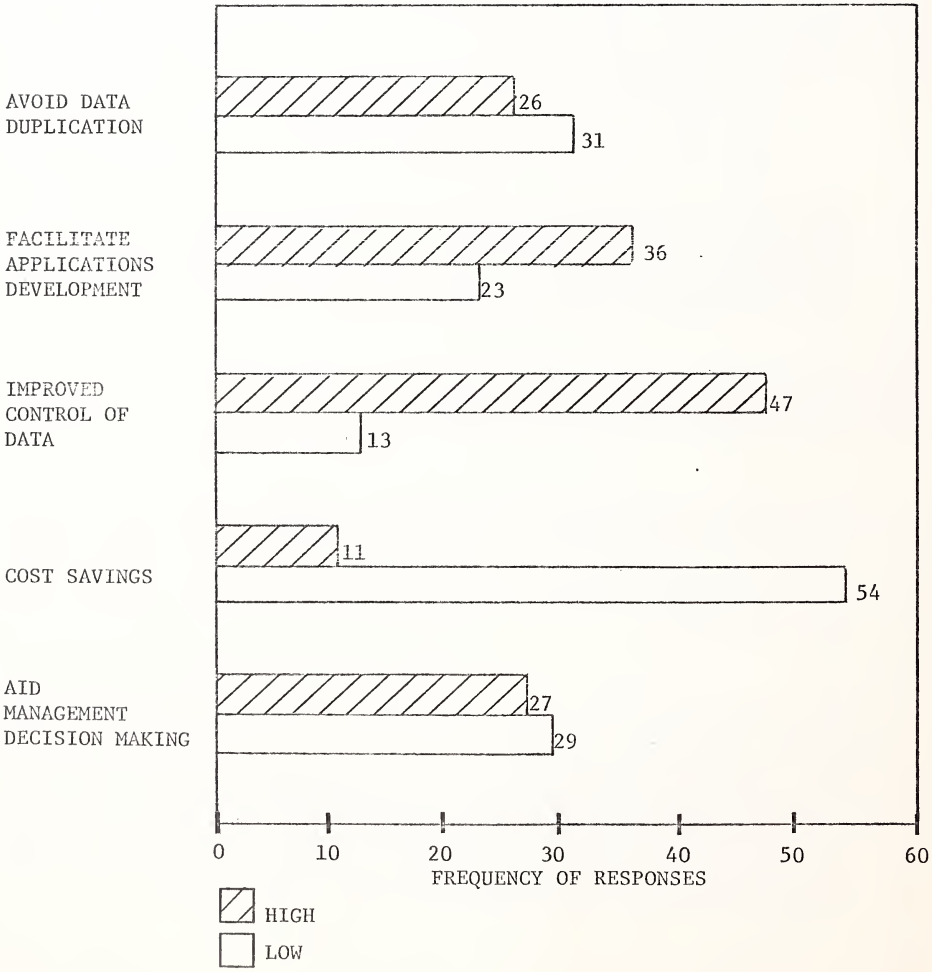
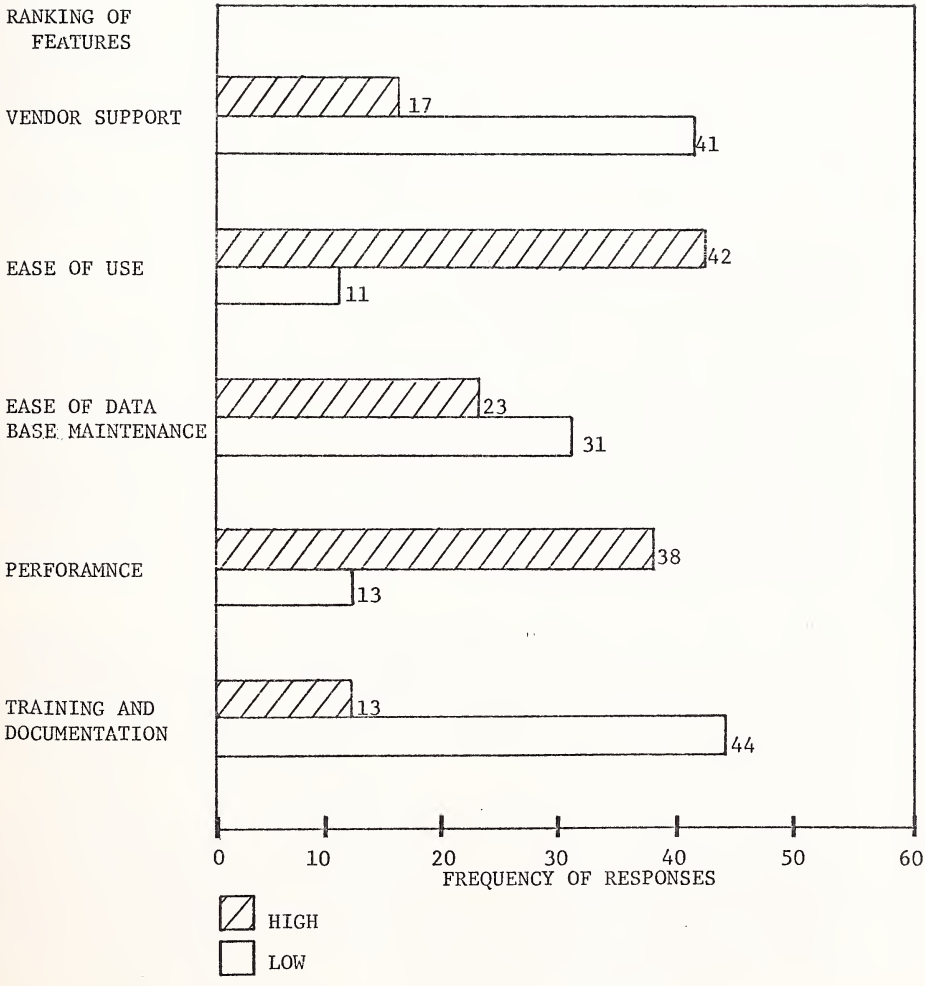


EXHIBIT V-4

USER RANKINGS OF

REQUIRED IMPROVEMENTS

(FREQUENCY OF HIGH & LOW RATINGS)



- Users were also asked about the adequacy of performance information and 51% said they were satisfied. Those who wanted to see improvement stressed the unpredictability of applications impact on the overall system and the inability to determine how much resource the DBMS was using.

- The general facilities of DBMS systems requiring improvement (or implementation) disclosed that the most frequently requested improvement was for an improved communications interface and query language. The data model stands out clearly as the least important feature from the users' point of view. (See Exhibit V-5.)

- Responses to the preference for data model were received from only one-third of the interviewees and were distributed evenly: 10 preferred hierarchical, 7 preferred network, and 8 preferred relational.

D. OFF-LOADING OF HOST SYSTEMS

- Fifty-seven percent of users felt a 20% transaction error rate on conventional data entry systems was too high and projected a more likely figure to be 5-10%. This may be partially due to the fact that many of the interviewees had responsibility for the data entry function. One interviewee who had done a detailed analysis of the operation of insurance agencies stated transaction error rates were in excess of 35%.

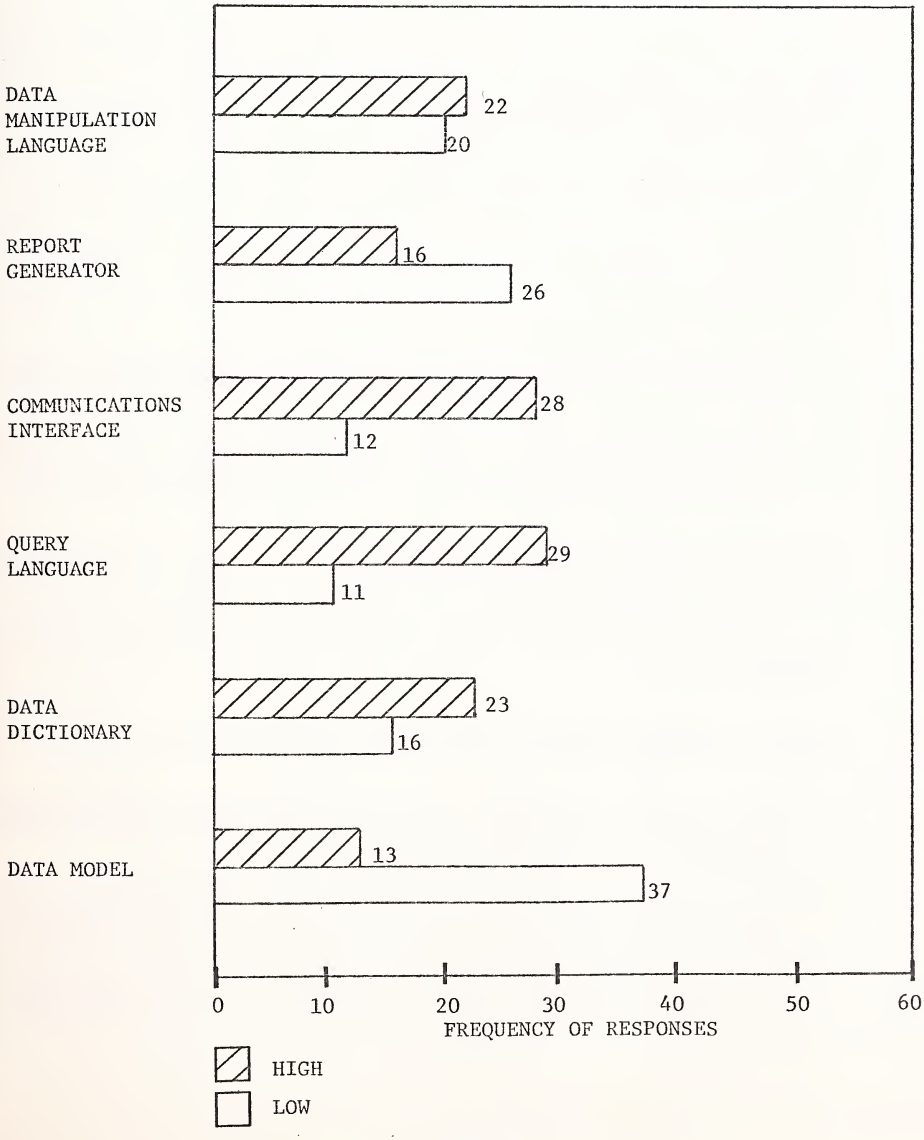
- The possibility of off-loading a host mainframe by 30% through editing and correction of entries at the point of transaction was deemed more likely. Forty-five percent said the estimate was too high; 43% said it was about right; and 12% said it was too low.

- The estimate that hosts could be off-loaded by 70% through the use of DBMS on minicomputers was rejected by users: 81% felt the figure was too high; 16% said it was about right; and 3% stated it was low. However, half the users estimated 40-50% off-loading was possible.

EXHIBIT V-5

FEATURES REQUIRING IMPROVEMENT OR IMPLEMENTATION

(FREQUENCY OF HIGH AND LOW RATINGS)



E. MINI DBMS USAGE

- An attempt was made to obtain information on current mini usage. No meaningful information was obtained. It seemed apparent that most central DP management does not have either control or knowledge of equipment installed outside of their own location or organization.

- Over 80% of 70 respondents stated they were reasonably certain no installed minis were making significant use of DBMS.

- However, interviewees felt DBMS would be attractive on minicomputers:

  - Seventy percent of the respondents stated it would be attractive to them.

  - Sixty-seven percent felt mini DBMS would be attractive to end users.

  - Seventy percent felt "non-EDP" end users could obtain meaningful results from such systems without assistance from programmers.

- Interviewees who did not have a DBMS installed were more enthusiastic than current users about the prospect of mini DBMS. Seventy-six percent found such systems attractive and 79% felt "non-EDP" end users could obtain meaningful results.

- Exhibit V-6 displays reactions to statements about both DBMS and DDP:

  - The reaction to DBMS is uniformly positive and even the current software received a vote of confidence.

  - On the other hand, while only 11% of the respondents felt DDP was "just a fad," the reaction was generally negative. It is probable that this can be directly attributable to IBM's go slow attitude with SNA.

EXHIBIT V-6

USER REACTIONS TO STATEMENTS

CONCERNING DBMS AND DDP

USER REACTIONS	DBMS		DDP		NUMBER OF RESPONSES	
	TRUE %	FALSE %	TRUE %	FALSE %	DBMS	DDP
COST EFFECTIVE	76 %	24 %	58 %	42 %	71	72
THE WAY TO GO	78	22	48	52	69	60
WON'T BE EFFECTIVE FOR 5 YEARS	22	78	47	53	73	64
NEEDS CENTRAL CONTROL	92	8	90	10	74	67
USERS WANT IT	47	53	69	31	70	65
SOFTWARE POOR	21	79	74	26	71	62
JUST A FAD	1	99	11	89	73	66
MANAGEMENT LIKES IT	85	15	39	61	71	62
HELPS APPLICATIONS DEVELOPMENT	96	4	38	62	72	66
MOST PEOPLE WONT UNDERSTAND	90	10	88	12	73	68

- There was general consensus that most people don't understand either DBMS (90%) or DDP (88%). It is probable that this can be attributed to the normal state of confusion which prevails in the data processing user community.

- Exhibit V-7 plots the understanding the respondents felt other data processing managers in their company would have of some commonly used terms. As usual, the relational data model does not fare too well but value added networks are even less well understood. The overall pattern does not demonstrate the respondents have much confidence in their collegues - 91% felt it was important to have an understanding of such terms.

F. CONTROL OF DISTRIBUTED DATA PROCESSING

- Assuming that Intel would be at the high end of the minicomputer price range, the interviewees were asked what size restrictions they would place on minicomputer systems in a DDP envrionment:

  - Sixty-five percent of the 66 respondents stated they would not restrict the size of such systems.

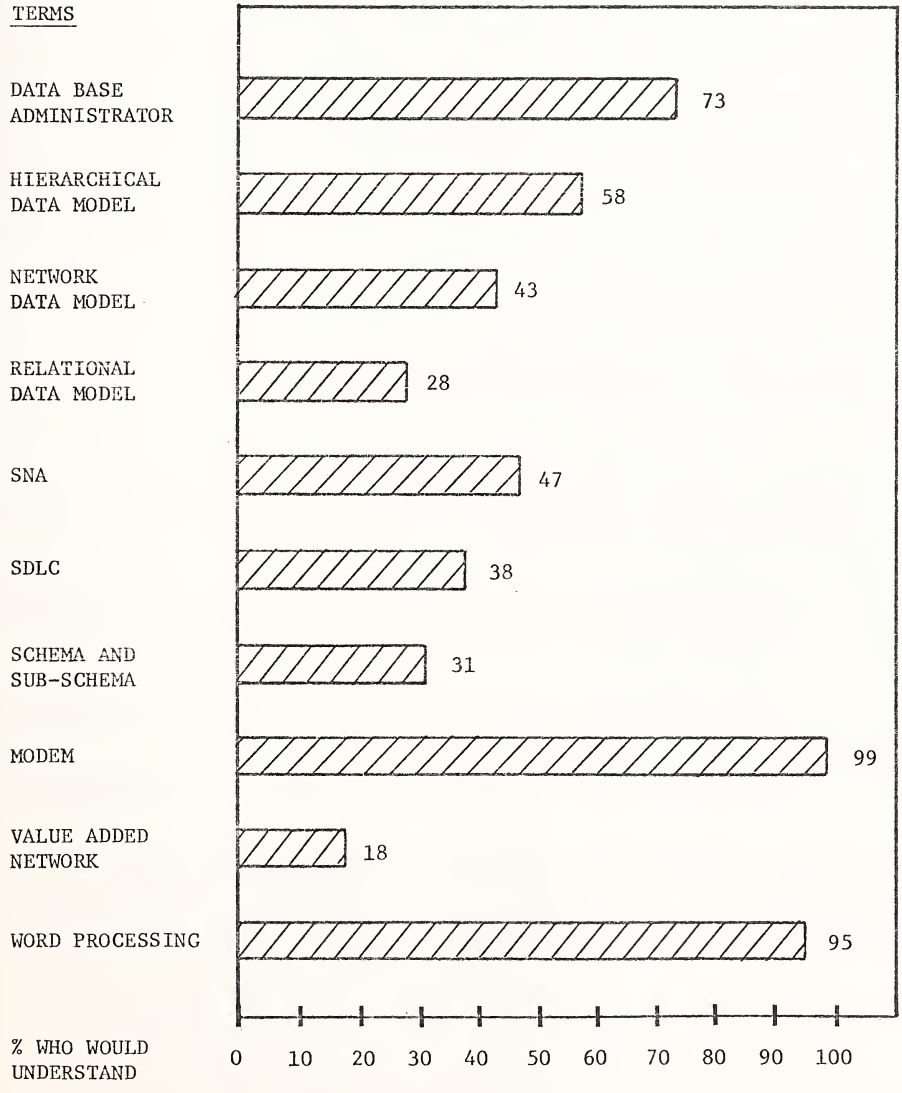
  - When asked what the upper limit should be on size, 63% of 40 respondents stated less than $100K.

- It had been ssumed that most EDP managers would want to restrict the size of minicomputers. The fact they did not is a positive factor for Intel's standalone DCB.

EXHIBIT V-7

RESPONDENTS' PERCEPTION OF OTHER
DP MANAGERS' KNOWLEDGE

(% WHO WOULD UNDERSTAND)



G. MERGING OF WORD PROCESSING AND DATA PROCESSING

- The possible integration of word and text processing with data processing has major ramifications for future data base systems design.

  - Eighty-four percent of 68 respondents felt this would occur.

  - Eighty-three percent felt DP management should be involved in the selection of word processing equipment.

  - Sixty-four percent felt the Data Base Administrator should be involved in the selection of such equipment.

H. APPLICATIONS AND INDUSTRY ORIENTATION

- Exhibit V-8 displays the results of respondent's reactions to implementation of various applications using DBMS and in a DDP environment:

  - Only image storage and retrieval received a negative vote in the DBMS area and it is probable that this concept was not clearly understood.

  - Only strategic planning received a negative vote in a DDP environment.

  - There are obviously broad applications possibilities available for DBMS.

- The types of applications which have been implemented by users of DBMS tend to confirm its broad applications base. Appendix A contains a list of implemented applications by industry.

EXHIBIT V-8

USER REACTION TO THE IMPLEMENTATION OF APPLICATIONS

USING DBMS AND DDP

APPLICATION	DBMS		DDP		NUMBER OF RESPONSES	
	YES (%)	NO (%)	YES (%)	NO (%)	DB	DDP
PAYROLL	82%	18%	57%	43%	72	63
DATA ENTRY	58	42	95	5	71	64
GENERAL ACCOUNTING	89	11	58	42	70	62
PERSONNEL	99	1	62	38	70	63
BILL OF MATERIALS	98	2	91	9	66	54
MATERIALS REQUIREMENT PLANNING	94	6	72	28	63	53
TEXT PROCESSING	50	50	80	20	64	55
MANAGEMENT INFORMATION SYSTEMS	100	0	62	38	71	63
STRATEGIC PLANNING	79	21	46	54	66	57
CUSTOMER/SALES RECORDS	99	1	83	17	70	59
ACCOUNTS RECEIVABLE/PAYABLE	96	4	67	33	69	58
IMAGE STORAGE/TRANSMISSION	32	68	65	35	66	48

- In the question on industries best suited for DBMS and DDP, an attempt was made to have respondents designate both industries which were "more" suited and "less" suited. However, all industries received positive ratings in both categories. (See Exhibit V-9.)

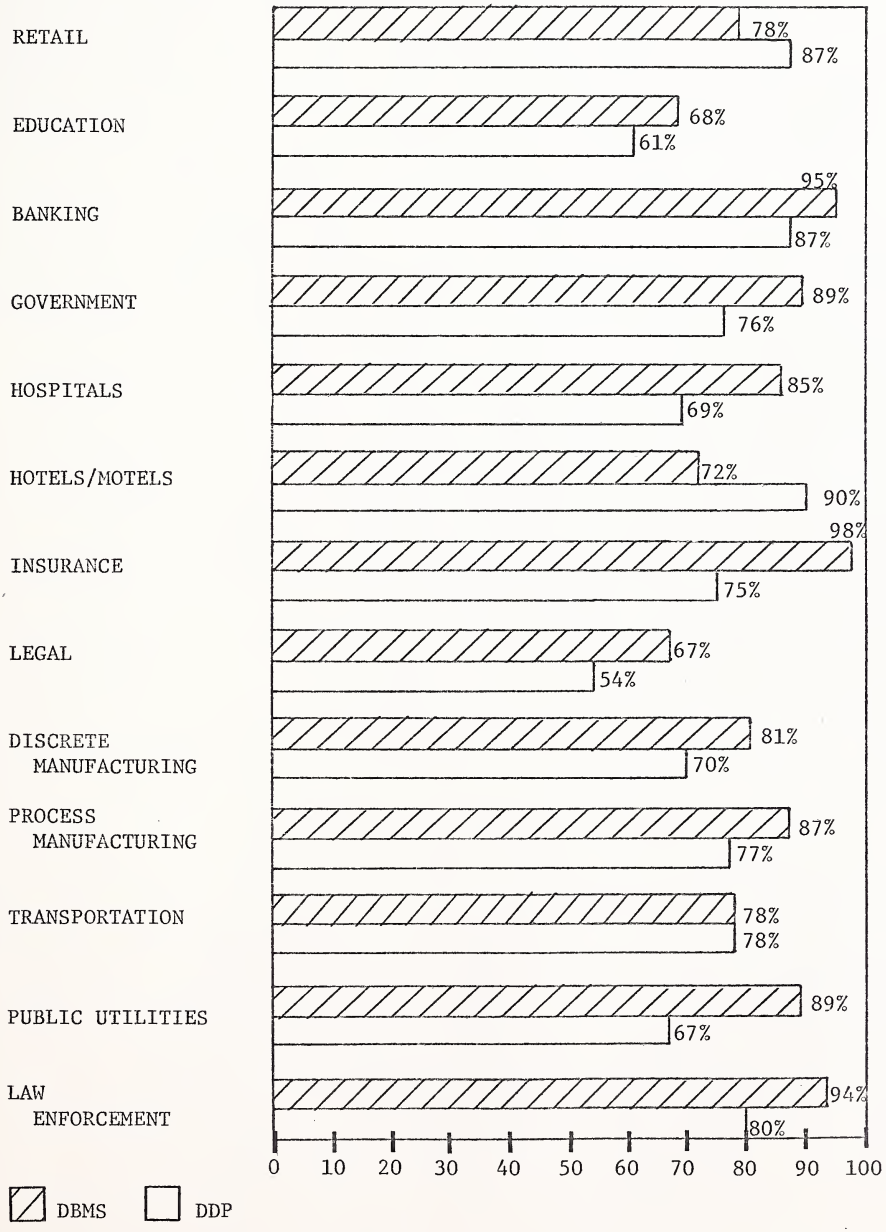
- It is concluded that both DBMS and DDP are universal in concept and judgement must be exercised in selecting the best market opportunities. The potential market approaches the totality of commercial data processing.

EXHIBIT V-9

RESPONDENTS' DESIGNATION OF INDUSTRIES

BEST SUITED FOR DBMS & DDP

(% OF POSITIVE RESPONSES)



VI STANDALONE MARKET FORECAST 1980-87

VI STANDALONE MARKET FORECAST 1980-87

A. FORECAST ASSUMPTIONS

- Due to marketing and support requirements only a domestic forecast is presented.
- The standalone systems will normally be sold to large companies with requirements for multiple systems and will therefore be a form of distributed processing.
- The systems normally will not involve the replacement (or conversion) of existing systems.
- The standalone DBC will have a substantial (approximately 5 times) performance advantage over comparably priced, competitive systems without the benefit of RAP.
- Product marketing and support (except software) will compare to that provided by current minicomputer vendors.
- The standalone DCB will have only limited language support and is directed toward "non-EDP" end users.
- The revenues projected were based on the assumption that average system price would be less than $200K.
- It was assumed that shipments could begin in 1980.

B. MARKET FORECAST METHODOLOGY

- The total potential U.S. market for minicomputer systems is presented in Exhibit VI-1, along with annual shipments and market penetration. This forecast was made based on industry establishment sizes and projected ability to justify a minicomputer system.

- This potential market must be reduced by 40% to reflect minis which are not directed toward the commercial market where data base systems are most appropriate.

- It is also estimated that only 10% of those units will be for large scale systems ($150K-$200K) where the proposed DBC will be marketed. This results in a potential DBC market of only 6% of the total units, but a substantially higher percentage of the revenue as illustrated in Exhibit VI-2.

- The forecast for total mini-DBC shipments is then made from 1982 through 1987 and "reasonable" Intel penetration of this market is projected. (See Exhibit VI-3.)

- We have assumed that the average price per unit will remain under $200,000. If either the installed base or new shipments tend to grow significantly above this level the market would obviously be increased.

- Possible revenues from maintenance or sale of software are not included in the forecast.

- This is a substantial market under any circumstances and Intel's projected share will approach $.5 billion by 1987.

EXHIBIT VI-1

U.S. MINICOMPUTER AND SBC SYSTEM SHIPMENTS (UNITS)

(1977-82, 1987)

YEAR	(A) GROSS MARKET POTENTIAL (000)	(B) ANNUAL SHIPMENTS (UNITS) (000)	(C) ANNUAL SHIPMENTS ($ MILLION)	(D) UNITS INSTALLED (000)	(E)* PENETRATION (%)
1977	1,420	70	$ 2,150	240	5.9%
1978	1,564	90	3,240	330	7.3
1979	1,725	115	4,140	445	9.0
1980	1,898	144	5,184	589	11.0
1981	2,070	178	6,408	767	13.6
1982	2,300	218	7,848	985	16.6
1987	2,800	542	19,512	2,800	**

* $E = \frac{B}{(A - D)}$

** MATURE MARKET

EXHIBIT VI-2

POTENTIAL MINI-DBC MARKET

YEAR	TOTAL SHIPMENTS		MINI DBC SHIPMENTS		
	UNITS (000)	$ (MILLION)	UNITS (000)	$ (MILLION)	% DBC/TOTAL $
1982	218	$ 7,848	13	$ 1,625	21%
1987	542	$19,512	32	$ 4,800	25%

EXHIBIT VI-3

INTEL "STANDALONE" DBC FORECAST

1980 - 1987

YEAR	TOTAL MINI-DBC SHIPMENTS		INTEL MINI-DBC SHIPMENTS		
	UNITS (000)	$ (MILLION)	UNITS	$ (MILLION)	% INTEL/TOTAL UNITS
1980	8.0	$ 1,000	40	$ 6	0.5
1981	10.7	1,300	107	16	1.0
1982	13.0	1,625	195	29	1.5
1983	15.6	1,950	350	53	2.25
1984	19.0	2,375	641	96	3.375
1985	22.5	2,925	1,063	170	4.725
1986	27.0	3,780	1,620	275	6.0
1987	32.0	4,800	2,400	432	7.5

C. QUALIFICATIONS

- IBM will probably announce a new product to address the DDP marketplace either before (or shortly after) Intel's product is ready for shipment. The impact of the announcement is difficult to predict but it probably will not be favorable on the forecast.

VII STANDALONE VS. BACKEND DBC

VII STANDALONE VS. BACKEND DBC

A. COMPARISON OF REVENUE

- The forecast for the backend DBC was only made through 1983 in the previous study. INPUT projects the market for backend systems for currently installed and announced IBM products will remain strong through the range of the standalone forecast presented in the previous chapter.

- This projection is based on an expansion of the potential market for backend DBC which should occur when IBM announces a new product line in the early 1980s.

- For comparison purposes the backend forecast has been extended through 1987. (See Exhibit VII-1.) It presents two cases: one with 20% annual growth and the other with 10% growth. It can be seen that cumulative revenue for the backend system exceeds that for the standalone system until at least 1986.

B. EVALUATION OF CRITICAL ISSUES

- In order to evaluate the critical issues it is desirable to have a framework for comparison. Exhibit VII-2 contains a list of critical issues and INPUT's rough evaluation of them. Not included is any evaluation of relative hardware development or manufacturing difficulty.

EXHIBIT VII-1

POTENTIAL INTEL REVENUE:
"STANDALONE" VS "BACKEND" DBC
($ MILLION)

	1980	1981	1982	1983	1984	1985	1986	1987
"STANDALONE"								
SHIPMENTS	6	16	29	53	96	170	275	432
CUMULATIVE	6	22	51	104	200	370	645	1,177
"BACKEND" CASE 1								
SHIPMENTS	3	20	50	120	144	173	207	249
CUMULATIVE	3	23	73	193	337	510	717	966
"BACKEND" CASE 2								
SHIPMENTS				120	132	145	160	176
CUMULATIVE				193	325	470	630	806

EXHIBIT VII-2

EVALUATION OF CRITICAL ISSUES*

"STANDALONE" VS "BACKEND" DBC

ISSUES	"STANDALONE"	BACKEND
DISTINCT PRODUCT	3	1
MARKET SIZE	1	2
MARKETING	5	4
MAINTENANCE	5	4
SOFTWARE	5	4
TRAINING	4	4
SYSTEMS SUPPORT	5	4
CONVERSION	3	5
PERFORMANCE	2	1
COMPETITION	5	1

* 1 = DEFINITE ADVANTAGE
2 = POSSIBLE ADVANTAGE
3 = NEUTRAL
4 = POSSIBLE PROBLEM
5 = DEFINITE PROBLEM

The rationale behind each individual evaluation is as follows:

- Distinct Product - The backend computer can be sold as a new part of the memory and processing hierarchy - the standalone must be sold in direct competition with established vendors.

- Market Size - The long-term market for the smaller standalone is larger as the industry moves toward distributed processing.

- Marketing - Minicomputers are frequently sold to non-EDP end users (as opposed to centralized organizations). This presents a more difficult marketing problem than selling to customers who may already be familiar with Memory System's products.

- Maintenance - There will be more sites in more geographic locations for the standalone (for the same or less revenue).

- Software - By the time the standalone system is delivered, minicomputer users will have to come to expect a full set of systems software including multiple procedural languages. In addition, a broader applications set must be addressed and software houses will not be familiar with the system.

- Training - It is assumed that training will be conducted centrally in either case.

- Systems Support - Because the standalones will be installed with less sophisticated customers, more hand holding will be required.

- Conversion - Conversion will definitely limit the sale of backends where the customer has a substantial amount of his applications already implemented under a DBMS. However, this was considered in the original forecast.

- Performance - The backend is competing against a notoriously poor performer. The standalone must compete against the unpredictable performance of the 1980s.

- Competition - IBM is the only current competition for the backend, and they have other problems to solve. The standalone will be competing against every current hardware manufacturer and probably several new ones.

APPENDIX A: IMPLEMENTED APPLICATIONS BY INDUSTRY

APPENDIX A: IMPLEMENTED APPLICATIONS BY INDUSTRY

BANKING	Trust (Inquiry)
	Municipal Bonds
	Demand Deposit
	Credit Card Accounting
DM	General Ledger
	Order Entry
	Inventory Control
	Payroll
	Work In Process
	Manufacturing Control System
	Integrate Financial
	Billing
PROCESS	Accounts Receivable
	Market Information
	Order Entry & Processing
	Inventory Control
	Financial
	AP/AR
	Purchasing
	Administrative Message Switching
	Tab Data
	Payroll
	Benefits

RETAIL	Merchandise Processor
	General Accounts
	Personnel
	Payroll
	Inventory Control
	AP/AR
EDUCATION	Student Data Base
	Employee Data Base
	Financial System
STATE/LOCAL	Tax (Refunds)
	Parking Ticket
	Financial Information
	Master Property File
	Personnel Information Systems And Development
	Management Reporting
	Employer Statistics
	Employment History
INSURANCE	Project Administration
	Medical Fees
	Pension Administration
	Stockholder Records
	Group Insurance
	Personnel
UTILITIES	Customer Information
	Personnel
	Construction Management
MEDIA	Sales Inventory
	Revenue Billing/Compensation
	Audience Research
	On-Line Order Entry

MEDICAL	Direct Mail (Funds)
	Patient Billing (AR)
	Admission/Discharge/Transfer
	Purchasing (On-Line)
	Clinical Data
	Patient Data
	Personnel